

REMARKS

I. Claim Objections

Claims 13 and 14 are objected to because of the following informalities: the Examiner indicated that it appears Applicant has switched the two different groups of material listings between claim 13 and 14. The Examiner asserted that claim 13 is drawn to alloys, but lists what Applicant calls "metals-nonmetal compounds". Claim 14 recites metal-nonmetal compounds, but recites alloys. Appropriate correction is required.

The Applicant notes that claims 13 and 14 have been amended as indicated herein to make these corrections. Thus, aforementioned informalities have been requested. The Applicant therefore respectfully requests withdrawal of the objections to claims 13 and 14.

II. Claim Rejections – 35 USC § 112

Claim 8 was rejected by the Examiner under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The Examiner argued that it is unclear what additional structure and control is required in order to perform the given function. The Examiner asserted that the Applicant must establish the specific control that is required for producing vibrations to shake away the analytes from the bonding surfaces. Furthermore, the Examiner indicated that the bonding surfaces lack antecedent basis in the claims and Applicant has not positively recited the analytes being bound to any such surfaces. The Examiner argued that as currently recited, a sensor with the same structure required by the preceding claims will be taken to have the capability of producing vibrations as recited in claim 8.

The Applicant notes that claim 8 has been cancelled by amendment as indicated herein. Thus, the rejection to claim 8 under 35 U.S.C. 112 is rendered moot.

Claims 11, 17, and 20 were rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The Examiner argued that it is unclear what type of vibration is being recited given the functional limitations of the claim. The Examiner asked, what type of vibrations does the dual mode acoustic wave sensor have to produce in order to provide for breaking down bonding connections between analyzer and the plurality of sensing components? The Examiner further asked, what additional structure is involved in the respective devices for producing such vibrations? The Examiner also asked, what kind of bonding is being broken? The Examiner asserted that as currently recited a multiple mode/dual mode/multi-mode SAW acoustic wave sensor with the same structural limitations as required in claims 1, 15, and 19, respectively, will be taken to be capable of producing such vibrations.

The Examiner also asked, with respect to claims 20, what additional structure is provided in the humidity sensor that provides for the shaking away of water droplets?

The Applicant notes that claims 11, 17, and 20 have been cancelled by amendment as indicated herein. Thus, the rejection to claims 11, 17, and 20 under 35 U.S.C. 112 is rendered moot, along with all of the aforementioned issues and questions raised by the Examiner with respect to claims 11, 17 and 20.

Claims 10 and 20 were rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The Examiner argued that it is unclear what further structure is required in order for the multiple mode SAW sensor to be a humidity sensor. What further structure allows for the recited "...to shake away any water droplets condensing upon said SAW sensor, thereby

permitting said SAW sensor to recover quickly from water saturation". The Examiner asserted that claims 10 and 20 contain purely functional language but do not establish any further limiting structural elements that would provide for such a specific type of SAW sensor.

The Applicant notes that claims 10 and 20 have been cancelled by amendment as indicated herein. Thus, the rejection to claims 10 and 20 under 35 U.S.C. 112 is rendered moot, along with all of the aforementioned issues and questions raised by the Examiner with respect to claims 10 and 20.

Claims 13 and 14 were rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The Examiner argued that claim 13 recites that the electrode material is chosen from a group of alloys, however the materials that follow are not alloys. The Examiner also argued that claim 14 recites that the electrode materials comprise metal-nonmetal compounds, however the materials listed are alloys. The Examiner asserted that it appears Applicant has mistakenly switched the two sets of materials. The Examiner indicated that he will read claim 13 to comprise at least one of the following metal-nonmetal compounds, and claim 14 to read at least one of the following alloys. The Examiner also noted that the "2" in "CoSi2" should be sub-scripted to remove any indefiniteness and to properly recite the material.

The Applicant notes that claims 13 and 14 have been amended as indicated herein to make these corrections. Thus, the aforementioned rejection to claims 13 and 14 is traversed. The Applicant therefore respectfully requests withdrawal of the rejection to claims 13 and 14 under 35 U.S.C. 112.

III. Claim Rejections – 35 USC § 102

Requirements for *Prima Facie* Anticipation

A general definition of *prima facie* unpatentability is provided at 37 C.F.R.

§1.56(b)(2)(ii):

A *prima facie* case of unpatentability is established when the information *compels a conclusion* that a claim is unpatentable under the preponderance of evidence, burden-of-proof standard, giving each term in the claim its broadest reasonable construction consistent with the specification, and before any consideration is given to evidence which may be submitted in an attempt to establish a contrary conclusion of patentability. (*emphasis added*)

"Anticipation requires the disclosure in a single prior art reference of each element of the claim under consideration." *W.L. Gore & Associates v. Garlock, Inc.*, 721 F.2d 1540, 220 USPQ 303, 313 (Fed. Cir. 1983) (citing *Soundscraper Corp. v. United States*, 360 F.2d 954, 960, 148 USPQ 298, 301 (Ct. Cl.), *adopted*, 149 USPQ 640 (Ct. Cl. 1966)), *cert. denied*, 469 U.S. 851 (1984). Thus, to anticipate the applicants' claims, the reference cited by the Examiner must disclose each element recited therein. "There must be no difference between the claimed invention and the reference disclosure, as viewed by a person of ordinary skill in the field of the invention." *Scripps Clinic & Research Foundation v. Genentech, Inc.*, 927 F.2d 1565, 18 USPQ 2d 1001, 1010 (Fed. Cir. 1991).

To overcome the anticipation rejection, the applicants need only demonstrate that not all elements of a *prima facie* case of anticipation have been met, *i.e.*, show that the reference cited by the Examiner fails to disclose every element in each of the applicants' claims. "If the examination at the initial state does not produce a *prima facie* case of unpatentability, then without more the applicant is entitled to grant of the patent." *In re Oetiker*, 977 F.2d 1443, 24 USPQ 2d 1443, 1444 (Fed. Cir. 1992).

Vig

Claims 1, 2, 11 and 15-17 are rejected under 35 U.S.C. 102(b) as being anticipated by Vig et al. (*Chemical Sensor Based on Quartz Microresonators*; June 1996), hereafter Vig.

The Examiner argued that Vig discloses a chemical sensor that consists of an array of quartz microresonators. The Examiner also asserted that Vig discloses that a microresonator can act as a quartz crystal microbalance and as a calorimeter, simultaneously, because quartz resonators can be highly sensitive to both mass and temperature changes. The Examiner also argued that Vig further discloses that by applying a variety of thin-film adsorbers to the different resonators in an array and observing the pattern of frequency changes due to an unknown that is admitted into the resonator array enclosure, one can detect and identify chemical and biological agents (i.e., the Examiner cited Vig, abstract: page 138, right-hand column item II).

The Examiner also asserted that Vig discloses that dual-mode SC-cut resonators have been developed for high-stability low-power oscillators. The Examiner additionally argued that Vig discloses that such resonators allow two well-behaved temperature-compensated modes to be excited simultaneously such that the beat frequency between the two modes is a steep and monotonic function of temperature. The Examiner further asserted that Vig discloses that dual-mode microresonators may be useful as chemical sensors, such that one of the temperature insensitive modes can be used for sensing the mass loading, while the beat frequency is used a temperature sensor (i.e., the Examiner referred to Vig, page 139, left-hand column, first two paragraphs).

The Applicant respectfully disagrees with this assessment.

Regarding amended claim 1, the Applicant notes that claim 1 is directed toward all of the following claim limitations:

A multiple modes sensing system, comprising:
an acoustic wave sensor comprising a plurality of sensing components for monitoring a chemical species, wherein said plurality of sensing components is disposed

within a cavity formed from a plurality of walls of said acoustic wave sensor, wherein each sensing component of said plurality of sensing components is coated with a differing sensing film;

a plurality of oscillators associated with said plurality of sensing components, wherein each sensing components of said plurality of sensing components is located in a feedback loop with an oscillator of said plurality of oscillators to thereby provide a multiple mode acoustic wave sensor that provides multiple mode frequency outputs thereof; and

a frequency counter that communicates with said plurality of oscillators, wherein said frequency counter is under the command of a processor, wherein a calculated difference among said multiple mode frequency outputs is utilized to promote an increase in sensing accuracy by eliminating responses due to environmental changes other than said monitored chemical species.

The Vig reference does not disclose each and every one of these claim limitations. For example, Vig does not disclose a frequency counter, and one that communicates with a group of oscillators. Additionally, Vig does not disclose a processor and a frequency counter under the control of the processor. Vig also does not disclose the calculated difference among multiple frequency outputs and the use of such a calculated difference to promote a sensing accuracy increase along with the elimination of responses due to environmental changes other than the monitored chemical species. Instead, Vig discloses a chemical sensor that utilizes microresonators, but which does not use a calculated difference among multiple mode frequency outputs to promote an increase in sensing accuracy by eliminating responses due to environmental changes other than said monitored chemical species. Instead, Vig relies on the total frequency change of an individual resonator and the sum of the frequency change (rather than the calculated difference with respect to multiple mode frequency outputs) due to mass loading and frequency change due to the change in temperature which does not result in a sensing accuracy increase along with the elimination of responses due to environmental changes other than the monitored chemical species. This is a subtle but very important difference between the Vig reference and Applicant's claim 1 limitations.

Additionally, Vig does not provide for any disclosure and/or teaching of a feedback loop with an oscillator of the plurality of oscillators to thereby provide a multiple mode acoustic wave sensor that provides multiple mode frequency outputs thereof. These particular features are not disclosed or suggested by Vig.

The Vig reference teaches a chemical sensor which is coated with affinity/adsorption type sensing materials that possess problems when desorbing the analyte(s) after the sensor is exposed to the analyte(s), thereby increasing the response time and running the risk of losing functionalities following the initial exposure of the sensor to the substance sought to be detected by the sensor. Applicant's invention, on the other hand, provides for an improved acoustic wave sensor, which overcome these problems, and particularly, one which does not result in response time increases and the loss of functionalities following the initial exposure of the sensor to the substance sought to be detected. The Vig reference is a prior art sensor that is subject to response time increases and the loss of functionalities following the initial exposure of the Vig sensor to a substance to be detected. Applicant's sensor overcomes the problems with the Vig sensor.

The Applicant therefore submits that the rejection to claim 1 based on Vig fails under the aforementioned *prima facie* anticipation test. That is, the Vig reference simply does not disclose each and every claim limitation of Applicant's claim 1. The rejection to claim 1 is thus traversed. Applicant respectfully requests withdrawal of the 102 rejection to claim 1 with respect to the Vig reference.

Regarding claim 2, the Applicant notes that claim 2 is directed toward a sensing component comprising a quartz crystal. Claim 2 also incorporates all of the claim limitations of Applicant's claim 1. Because Vig does not disclose each and every one of the claim limitations of Applicant's claim 1 as indicated above, Vig also does not disclose the combination of all the claim limitations of Applicant's claim 1 and the quartz crystal claim limitation of Applicant's claim 2.

The Applicant therefore submits that the rejection to claim 2 based on Vig fails under the aforementioned *prima facie* anticipation test. That is, the Vig

reference simply does not disclose each and every claim limitation of Applicant's claims 1 and. The rejection to claim 2 is thus traversed. Applicant respectfully requests withdrawal of the 102 rejection to claim 2 with respect to the Vig reference.

Regarding the rejection to claim 11 under 35 U.S.C 102(b) based on the Vig reference, the Applicant notes that claim 11 has been cancelled by amendment. Thus, the rejection to claim 11 is rendered moot.

Regarding the rejection to claims 15-17, the Applicant notes that the arguments presented above against the rejection to claim 1 and 2 apply equally against the rejection to claims 15-17. In the interest of brevity, the Applicant will not repeat these arguments. The rejection to claims 15-17 thus is also traversed by the same logic. Applicant therefore respectfully requests withdrawal of the rejection to claims 15-17 under 35 U.S.C. 102(b).

Kim

Claims 1, 2, 9, 11, and 15-19 are rejected under 35 U.S.C. 102(b) as being anticipated by Kim (U.S. Patent No. 6,293,136).

The Examiner argued that Kim discloses a multiple mode operated surface acoustic wave sensor. In support of this argument, the Examiner asserted that Kim discloses that the modes are a combination of a temperature effect and a measurand effect. The Examiner argued that Kim discloses that the measurand effect is caused by the absorption and/or adsorption of a substance into a selective coating on the piezoelectric substrate. The Examiner also argued that Kim discloses that the temperature effect is effectively eliminated by simultaneously solving equations representative of the different modes of operation. Additionally, the Examiner argued that Kim further discloses that the sensor can be used to detect different chemicals or substances (abstract; lines 60-67, col. 3).

The Examiner asserted that Kim shows in figure 1 a SAW sensor 10 having a delay line configuration, the SAW sensor comprises a piezoelectric material 12 on

which are placed input interdigital electrodes 14 and output interdigital electrodes 16 (converting electrical energy into a surface acoustic wave). The Examiner further argued that Kim discloses that depending on the crystal cut, the SAW device can be operated with the combination of a SAW, leaky surface acoustic wave (LSAW) or pseudo surface acoustic wave (PSAW), and harmonic modes from a single device layout (citing Kim, lines 1-27, col. 3, fig. 1). The Examiner also argued that Kim discloses an example in which both surface acoustic waves and leaky surface acoustic waves exist in a thirty-sixty degree rotated Y-cut of lithium tantalite, and also possible piezoelectric materials including lithium niobate (citing Kim, lines 17-25, col. 3).

The Examiner further argued that Kim discloses that the present invention may be utilized in an array of sensors that have multiple coatings which may be utilized to increase the selectivity. The Examiner argued, for example, that an array of SAW sensors may be fabricated on a planar surface with selective coatings associated with each separate SAW device in the array (citing Kim, lines 20-48, col. 4). The Examiner further argued that Kim shows in figure 6 a block diagram that represents an overview of the system and the signal processing (citing Kim, lines 7-26, col. 5, fig. 6).

The Applicant respectfully disagrees with this assessment.

Regarding claim 1, Kim does not disclose each and every one of the following claim limitations:

A multiple modes sensing system, comprising:

an acoustic wave sensor comprising a plurality of sensing components for monitoring a chemical species, wherein said plurality of sensing components is disposed within a cavity formed from a plurality of walls of said acoustic wave sensor, wherein each sensing component of said plurality of sensing components is coated with a differing sensing film;

a plurality of oscillators associated with said plurality of sensing components, wherein each sensing components of said plurality of sensing components is located in a feedback loop with an oscillator of said plurality of oscillators to thereby provide a multiple mode acoustic wave sensor that provides multiple mode frequency outputs thereof; and

a frequency counter that communicates with said plurality of oscillators, wherein said frequency counter is under the command of a processor, wherein a calculated

difference among said multiple mode frequency outputs is utilized to promote an increase in sensing accuracy by eliminating responses due to environmental changes other than said monitored chemical species.

The Kim reference does not disclose each and every one of these claim limitations. For example, Kim does not disclose a frequency counter, and one that communicates with a group of oscillators. Additionally, Kim does not disclose a processor AND a frequency counter under the control of the processor. Kim also does not disclose the calculated difference among multiple frequency outputs and the use of such a calculated difference to promote a sensing accuracy increase along with the elimination of responses due to environmental changes other than the monitored chemical species. Kim not only does not disclose all of the structural limitations of Applicant's amended claim 1, but also does not disclose the actual functionalities and effects of implementing the claim limitations of claim 1. For example, Kim does not disclose sensing components disposed within a cavity formed from a plurality of walls of said acoustic wave sensor. Additionally, Kim does not disclose a sensing components coated with a differing sensing film. Neither the abstract of Kim; lines 60-67, col. 3 of Kim; lines 1-27, col. 3, fig. 1 of Kim, lines 20-48, col. 4 or Kim, lines 7-26, col. 5, fig. 6 disclose all of the claim limitations of Applicant's amended claim 1. As such, because Kim fails to teach each and every claim limitation of Applicant's amended claim 1, the rejection to claim 1 under 35 U.S.C. 102 based on Kim fails under the aforementioned *prima facie* anticipation test. That is, the Kim reference does not disclose each element recited therein with respect to Applicant's claim 1. There is thus clearly a difference between the claimed invention and the Kim reference disclosure, as viewed by a person of ordinary skill in the field of the invention. The Applicant has thus demonstrated that not all elements of a *prima facie* case of anticipation have been met, *i.e.*, the Kim reference cited by the Examiner fails to disclose every element in Applicant's claim 1 and hence, any claims that depend from Applicant's claim 1.

The Applicant therefore submits that the Kim reference does not disclose each and every claim limitation of Applicant's claim 1. Regarding the rejection to claims 2, 9, 11, and 15-19, the Applicant notes that the arguments presented above against the rejection to claim 1 apply equally against the rejection to claims 2, 9, 11, and 15-19. In the interest of brevity, the Applicant will not repeat these arguments. The rejection to claims 2, 9, 11, and 15-19 thus is also traversed by the same logic. Applicant therefore respectfully requests withdrawal of the rejection to claims 1, 2, 9, 11, and 15-19 under 35 U.S.C. 102(b).

IV. Claim Rejections – 35 USC § 103

Requirements for Prima Facie Obviousness

The obligation of the examiner to go forward and produce reasoning and evidence in support of obviousness is clearly defined at M.P.E.P. §2142:

"The examiner bears the initial burden of factually supporting any *prima facie* conclusion of obviousness. If the examiner does not produce a *prima facie* case, the applicant is under no obligation to submit evidence of nonobviousness."

The U.S. Supreme Court ruling of April 30, 2007 (*KSR Int'l v. Teleflex Inc.*) states:

"The TSM test captures a helpful insight: A patent composed of several elements is not proved obvious merely by demonstrating that each element was, independently, known in the prior art. Although common sense directs caution as to a patent application claiming as innovation the combination of two known devices according to their established functions, it can be important to identify a reason that would have prompted a person of ordinary skill in the art to combine the elements as the new invention does."

"To facilitate review, this analysis should be made explicit."

The U.S. Supreme Court ruling states that it is important to identify a *reason* that would have prompted a person to combine the elements and to make that analysis *explicit*. MPEP §2143 sets out the further basic criteria to establish a *prima facie* case of obviousness:

1. *a reasonable expectation of success; and*
2. *the teaching or suggestion of all the claim limitations by the prior art reference (or references when combined).*

It follows that in the absence of such a *prima facie* showing of obviousness by the Examiner (assuming there are no objections or other grounds for rejection) and of a *prima facie* showing by the Examiner of a *reason* to combine the references, an applicant is entitled to grant of a patent. Thus, in order to support an obviousness rejection, the Examiner is obliged to produce evidence compelling a conclusion that the basic criterion has been met.

Vig in view of Korsah

Claims 9 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Vig in view of Korsah et al. (6,044,332), hereafter Korsah.

The Examiner noted that Vig has been discussed above and admitted that Vig does not disclose that the acoustic wave sensor is a SAW sensor.

The Examiner argued that Korsah discloses a multiple mode sensing system (harmonic modes) comprising a surface acoustic wave sensor (SAW) (abstract; lines 13-67, col. 2). The Examiner therefore asserted that it would have been obvious to modify the Vig device to utilize the multi-mode SAW sensor taught by Korsah as a known alternative transducer for use in a multiple mode sensing system. The Applicant respectfully disagrees with this assessment and submits that the arguments presented above against the rejections under 35 U.S.C. 102 with respect to Vig apply equally against the rejection to claims 9 and 19 under 35 U.S.C 103(a). As indicated previously Vig does not teach all of the claim limitations of Applicant's claims.

Additionally, the Applicant notes that the Examiner has not identified a *reason* that would have prompted a person to combine the elements of the references as suggested, and has not provided an analysis that is explicit. The Examiner has not also explained why a reasonable expectation of success would result from such a combination and how the combined references provide for the teaching or suggestion of ALL the claim limitations. Therefore, the Applicant submits that the rejection to claims 9 and 19 under 35 U.S.C. 103(a) based on Vig/Korash is also traversed.

Vig in view of Kim

Claims 9 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Vig in view of Kim (6,293,136).

The Examiner noted that Vig has been discussed above, and admitted that Vig does not disclose that the acoustic wave sensor is a SAW sensor. The Examiner also noted that Kim has been discussed above and argued that it would have been obvious to modify the Vig device to utilize the multi-mode SAW sensor taught by Kim as a known alternative transducer for use in a multiple mode sensing system.

The Applicant respectfully disagrees with this assessment and submits that the arguments presented above against the rejections under 35 U.S.C. 102 with respect to Vig and Kim apply equally against the rejection to claims 9 and 19 under 35 U.S.C 103(a). As indicated previously Vig and Kim do not teach all of the claim limitations of Applicant's claims. Therefore, the Applicant submits that the rejection to claims 9 and 19 under 35 U.S.C. 103(a) based on Vig/Kim is also traversed.

Kim in view of Ebersole

Claims 3-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kim in view of Ebersole et al. (5, 135, 852), hereafter Ebersole.

The Examiner argued that Kim has been discussed above, and admitted that Kim does not disclose FMP data, acoustic plate mode data, or SH-APM data.

The Examiner argued that Ebersole discloses that SAW devices represent an alternative piezoelectric transduction technique and asserted that Ebersole discloses that flexural plate-mode devices represent another alternative technology capable of measuring mass changes at the surface of a piezoelectric substrate (citing lines 53-67, col. 6 of Ebersole). The Examiner therefore argued that it would have been obvious to modify the Kim device to include a flexural plate-mode device for providing frequency outputs of FMP data such as taught by Ebersole in order to provide a known alternative device for producing data so as to measure changes at the surface of a piezoelectric substrate.

The Applicant respectfully disagrees with this assessment and submits that the arguments presented above against the rejections under 35 U.S.C. 102 with respect to Kim apply equally against the rejection to claims 3-8 under 35 U.S.C 103(a). As indicated previously Kim does not teach all of the claim limitations of Applicant's claims.

Additionally, the Applicant notes that the Examiner has not identified a *reason* that would have prompted a person to combine the elements of the references as suggested, and has not provided an analysis that is explicit. The Examiner has not also explained why a reasonable expectation of success would result from such a combination and how the combined references provide for the teaching or suggestion of ALL the claim limitations.

Therefore, the Applicant submits that the rejection to claims 3-8 under 35 U.S.C. 103(a) based on Kim/Ebersole is also traversed.

Kim in view of Kuisama

Claims 10 were 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kim in view of Kuisama et al. (4,378,168). The Examiner referred to the discussion of Kim indicated above, and admitted that Kim does not disclose that SAW sensor comprises a humidity sensor. The Examiner argued, however, that Kuisama discloses a SAW sensor for determining relative humidity

(referring to the abstract, lines 27-67, col. 1; line 65, col. 3 – line 8, col. 4; fig. 1 of Kuisama). The Examiner argued that it would have been obvious to modify the Kim device to have a SAW sensor comprising a humidity sensor such as taught by Kuisama in order to provide a known variant of a SAW sensor to determine relative humidity.

The Applicant respectfully disagrees with this assessment and notes that claim 10 and 20 have been cancelled by amendment as indicated herein. Thus, the rejection to claims 10 and 20 with respect to Kim and Kuisama under 35 U.S.C. 103(a) is rendered moot.

Vig in view of Kim and Kuisama

The Examiner rejected claims 10 and 20 under 35 U.S.C. 103(a) as being unpatentable over Vig in view of Kim as applied to claims 9 and 19 above, and further in view of Kuisama. The Examiner admitted that Vig in view of Kim does not disclose that SAW sensor comprises a humidity sensor. The Examiner also referred to the previous argument with respect to Kuisama. The Examiner therefore argued that it would have been obvious to modify the Vig/Kim device to have a SAW sensor comprising a humidity sensor such as taught by Kuisama in order to provide a known variant of a SAW sensor to determine relative humidity. The Applicant respectfully disagrees with this assessment and notes that claim 10 and 20 have been cancelled by amendment as indicated herein. Thus, the rejection to claims 10 and 20 with respect to Vig, Kim and Kuisama under 35 U.S.C. 103(a) is rendered moot.

Kim in view of Dreifus

Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kim in view of Dreifus et al. (5,838,089), hereafter Dreifus. The Examiner argued that Kim has been discussed above.

The Examiner also asserted that Kim does not specifically disclose that the sensing components comprise electrode materials chosen from among the group comprising at least one of Al, Pt, Au, Rh, Ir, Cu, Ti, W, Cr, and Ni.

The Examiner argued that Dreifus discloses acoustic wave devices that include a substrate, a diamond layer on the substrate, an interdigitated transducer structure, and an interlayer contacting the diamond layer and the transducer structure and a piezoelectric layer formed on the interlayer. The Examiner also asserted that Dreifus discloses that interdigitated electrodes are formed by deposition of aluminum onto the diamond layer (abstract, lines 7-51, col. 6).

The Examiner argued that it would have been obvious to modify the Kim device to include an aluminum material for the interdigitated transducer electrodes such as taught by Dreifus in order to provide a known conductive metal material for use in a surface acoustic wave device.

The Applicant respectfully disagrees with this assessment and notes that claim 12 has been cancelled by amendment as indicated herein. Thus, the rejection to claim 12 with respect to Kim and Dreifus under 35 U.S.C. 103(a) is rendered moot.

Kim in view of Josse

Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kim in view of Josse et al. (5,852,229)

The Examiner referred to the Kim discussion provided earlier and admitted that Kim does not specifically disclose that the sensing components comprise electrode materials chosen from among the group comprising at least one of Al, Pt, Au, Rh, Ir, Cu, Ti, W, Cr, and Ni. The Examiner argued that Josse discloses a piezoelectric resonator chemical sensing device in which the electrode can be a conductive substance such as silver and aluminum.

The Examiner argued that it would have been obvious to modify the Kim device to include an aluminum or silver material for the electrodes such as taught

by Josse in order to provide a known conductive metal material for use in a surface acoustic wave device.

The Applicant respectfully disagrees with this assessment and notes that claim 12 has been cancelled by amendment as indicated herein. Thus, the rejection to claim 12 with respect to Kim and Dreifus under 35 U.S.C. 103(a) is rendered moot.

Kim in view of Desu

Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kim in view of Desu et al. (U.S. Patent No. 5,527,567).

The Examiner noted Kim has been discussed above, and admitted that Kim does not specifically disclose that the sensing components comprise electrode materials chosen from among the group comprising at least one of TiN, CoSi₂, and WC.

The Examiner argued, however, that Desu discloses high quality layered structure oxide ferroelectric thin films which are useful in the applications of piezoelectric transducers and surface acoustic wave devices (citing Desu, lines 33-43, col. 4). The Examiner argued that Desu discloses that a thin bottom layer electrode is deposited on top of the substrate, and may be a conductive nitride such as TiN (citing Desu, lines 10-27, col. 6).

The Examiner therefore asserted that it would have been obvious to modify the Kim device to include TiN as the electrode material such as taught by Desu in order to provide a known electrode material, in the form of a conductive nitride, on the surface of a substrate for use in a surface acoustic wave device.

The Applicant respectfully disagrees with this assessment. The Desu reference only makes a short reference to "piezoelectric transducers and surface acoustic wave devices". There is not a detailed description or discussion of a piezoelectric device structure. Applicant's claim 13, which depends from claim 1

and includes all of the claim limitations of Applicant's amended claim 1 is directed toward sensing components comprising electrode materials chosen from among a group comprising at least one of the following metal-nonmetal compounds: TiN, CoSi₂, and WC.

Applicant's claim 13 relates to a multiple mode sensing device. In order to combine Desu with Kim as argued by the Examiner, there must at a minimum be some teaching of multiple mode sensing in the Desu reference. The mere mentioning of "piezoelectric transducers" is not sufficient motivation for one skilled in the art to combine Desu with Kim as argued by the Examiner to provide for a teaching of all the claim limitations of Applicant's claim 13 and claim 1. The Examiner has not identified a *reason* that would have prompted a person to combine the elements of the references as suggested, and has not provided an analysis that is explicit.

The Examiner has not also explained why a reasonable expectation of success would result from such a combination and how the combined references provide for the teaching or suggestion of ALL the claim limitations, given the fact that the Desu reference does not provide a detailed discussion of piezoelectric structures and devices and also provides no teaching of multiple mode sensing techniques and devices (which is taught by Applicant's claims and enabled by Applicant's specification).

As such, the Applicant submits that the rejection to claim 13 based on Kim/Desu has been traversed. The Applicant therefore respectfully requests withdrawal of the aforementioned rejection to claim 13.

Kim in view of Ueda

Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kim in view of Ueda et al. (6,037,847), hereafter Ueda.

The Examiner asserted that Kim has been discussed above, and admitted that Kim does not specifically disclose that the sensing components comprise electrode materials chosen from among NiCr and CuAl.

The Examiner argued, however, that Ueda discloses a surface acoustic wave device in which an interdigital electrode of an AlCu alloy is used with an Y-X cut of a LiTaO₃ (citing abstract; lines 7-17, col. 2). The Examiner therefore argued that it would have been obvious to modify the Kim device to include an AlCu alloy material for the interdigital electrode such as taught by Ueda in order to provide Kim with a known electrode material for a SAW device (for both surface and leaky surface acoustic waves) with a lithium tantalite piezoelectric material being used.

The Applicant respectfully disagrees with the assessment. The Ueda provides no teaching or hint of multiple mode sensing. In order to combine Ueda with Kim as suggested by the Examiner, the Ueda reference must provide at least some teaching of multiple mode sensing. One skilled in the art would not look to Ueda for combination with Kim to provide for all of the claim limitations of Applicant's amended claim 14, because Ueda provides no teaching whatsoever of multiple mode sensing.

The Examiner has not identified a *reason* that would have prompted a person to combine the elements of the references as suggested, and has not provided an analysis that is explicit. Reference was made to abstract; lines 7-17, col. 2 of Ueda, but the abstract, and lines 7-17, col. 2 of Ueda provide for no teaching of multiple mode sensing, which would be necessary if to be combined with Kim as argued.

The Examiner has not explained why a reasonable expectation of success would result from such a combination and how the combined references provide for the teaching or suggestion of ALL the claim limitations, given the fact that the Ueda reference does not provide any discussion whatsoever of multiple mode sensing techniques and devices (which is taught by Applicant's claims and enabled by Applicant's specification).

As such, the Applicant submits that the rejection to claim 14 based on Kim/Ueda has been traversed. The Applicant therefore respectfully requests withdrawal of the aforementioned rejection to claim 14.

Vig in view of Josse

Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Vig in view of Josse et al. (5,852,229)

The Examiner asserted that Vig has been discussed above and admitted that Vig does not specifically disclose that the sensing components comprise electrode materials chosen from among the group comprising at least one of Al, Pt, Au, Rh, Ir, Cu, Ti, W, Cr, and Ni.

The Examiner argued that Josse discloses a piezoelectric resonator chemical sensing device in which the electrode can be a conductive substance such as silver and aluminum. The Examiner therefore asserted that it would have been obvious to modify the Vig device to include an aluminum or silver material for the electrodes such as taught by Josse in order to provide a known conductive mental material for use in a surface acoustic wave device.

The Applicant respectfully disagrees with this assessment and notes that claim 12 has been cancelled by amendment as indicated herein. Thus, the rejection to claim 12 with respect to Vig and Josse under 35 U.S.C. 103(a) is rendered moot.

Vig in view of Desu

Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Vig in view of Desu et al. (U.S. Patent No. 5,527,567).

The Examiner asserted that Vig has been discussed above. The Examiner admitted that Vig does not specifically disclose that the sensing components comprise electrode materials chosen from among the group comprising at least one of TiN, CoSi₂, and WC. The Examiner argued, however, that Desu discloses high

quality layered structure oxide ferroelectric thin films which are useful in the applications of piezoelectric transducers and surface acoustic wave devices (citing lines 33-43, col. 4). The Examiner argued that Desu discloses that a thin bottom layer electrode is deposited on top of the substrate, and may be a conductive nitride such as TiN (citing lines 10-27, col. 6).

The Examiner therefore argued that it would have been obvious to modify the Vig device to include TiN as the electrode material such as taught by Desu in order to provide a known electrode material, in the form of a conductive nitride, on the surface of a substrate for use in a surface acoustic wave device.

The Applicant respectfully disagrees with this assessment and submits that the arguments presented above earlier against the rejection to claim 1 under 35 U.S.C. 102 based on Vig apply equally against the rejection to claim 13 based on Vig/Desu. Under the aforementioned *prima facie* obviousness test, the combination of Vig and Desu must teach all of the claim limitations of Applicant's claim 13. As indicated earlier, Vig does not teach all of the claim limitations of Applicant's claim 13 and claim 1. Additionally, the Desu reference only makes a short passing reference to "piezoelectric transducers and surface acoustic wave devices". There is not a detailed description or discussion of a piezoelectric device structure. There is also not any teaching of multiple mode sensing by Desu. Why would be inclined to combine Desu with Vig if there were not an explicit detailed teaching of multiple mode sensing in the Desu reference?

As such, the Applicant submits that the rejection to claim 13 based on Vig/Desu has been traversed. The Applicant therefore respectfully requests withdrawal of the aforementioned rejection to claim 13.

Vig in view of Ueda

Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Vig in view of Ueda et al. (6,037,847), hereafter Ueda.

The Examiner indicated that Vig has been discussed above, but admitted that Vig does not specifically disclose that the sensing components comprise electrode materials chosen from among NiCr and CuAl. The Examiner asserted, however, that Ueda discloses a surface acoustic wave device in which an interdigital electrode of an AlCu alloy is used with an Y-X cut of a LiTaO₃ (abstract; lines 7-17, col. 2).

The Examiner therefore argued that it would have been obvious to modify the Vig device to include an AlCu alloy material for the interdigital electrode such as taught by Ueda in order to provide Vig with a known electrode material for a SAW device (for both surface and leaky surface acoustic waves) with a lithium tantalite piezoelectric material being used.

The Applicant respectfully disagrees with this assessment and submits that the arguments presented above earlier against the rejection to claim 1 under 35 U.S.C. 102 based on Vig apply equally against the rejection to claim 14 based on Vig/Ueda. Under the aforementioned prima facie obviousness test, the combination of Vig and Ueda must teach all of the claim limitations of Applicant's claim 13. As indicated earlier, Vig does not teach all of the claim limitations of Applicant's claim 14 and claim 1. Additionally, the Ueda reference does not provide for any teaching of multiple mode sensing nor different coatings. Why would be inclined to combine Ueda with Vig if there were not an explicit detailed teaching of multiple mode sensing and different coatings in the Ueda reference?

As such, the Applicant submits that the rejection to claim 14 based on Vig/Ueda has been traversed. The Applicant therefore respectfully requests withdrawal of the aforementioned rejection to claim 14.

V. Conclusion

In view of the foregoing discussion, the Applicant has clarified the structural distinctions of the present invention. Applicant respectfully requests withdrawal of the election/restriction requirement based on the preceding amendments and

remarks. Reconsideration and allowance of Applicant's application is thus respectfully solicited.

Should there be any outstanding matters that need to be resolved, the Examiner is respectfully requested to contact the undersigned representative to conduct an interview in an effort to expedite prosecution in connection with the present application.

Respectfully submitted,



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Kermit Lopez
Attorney for Applicants
Registration No. 41,953
ORTIZ & LOPEZ, PLLC
P.O. Box 4484
Albuquerque, NM 87196-4484
Tel. (505) 314-1312